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TAIJI EMA

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EXAMINER

WARREN, MATTHEW E

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 05/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/050,113

Applicant(s)

EMA, TAIJI

Examiner

Matthew E. Warren

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 March 2006.
2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8, 12 and 14 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) 1, 4, 12 and 14 is/are allowed.
6) ☒ Claim(s) 2, 3 and 5-8 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the RCE and Amendment filed on March 6, 2006.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 2, 3, and 5-8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 2 contains the limitation that "a first insulation film fills spaces between the adjacent conductor patterns, **not extending over the etching stopper film**... and a sidewall insulation film formed on an inner wall of the contact hole, the sidewall insulation film **covering the sidewalls of the first insulation film**." The amended limitations are confusing because it is not understood how the sidewall insulation film could possibly be formed on a sidewall of the first insulation film if said insulation film does **not extend over the etching stopper film** (it is assumed that the insulation film is at least coplanar with or lower than the top surface of the etching stopper film if it does not extend over the etching stopper film). The limitation may be interpreted to mean that the first insulation film does not extend beyond the vertical boundaries of the etching stopper and into the area of the contact hole. In that sense, the limitation of the sidewall insulation film covering the side walls of the first insulation film would be appropriate. However, it is unclear which interpretation is intended and this renders the claim indefinite. Figure 1 of the applicant's drawings

shows that an insulation film (28) extends over an etching stopper film (22). In fact the insulation film extends on the etching stopper film. For purposes of examination, the limitation will be understood to mean that the "first insulation film fills spaces between the adjacent conductor patterns and extends above an upper surface of the etching stopper film... and a sidewall insulation film formed on an inner wall of the contact hole, the sidewall insulation film covering the sidewalls of the conductor pattern and the etching stopper film in the contact hole.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2, 3, and 5-7 as far as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Hosotani et al. (US 5,977,583) in view of Kimura (US 6,127,734).

In re claim 2, Fukase shows (figs. 1-2G) a base substrate (1), a first conducting film (5, 4) formed over the base substrate and including a plurality of conductor patterns adjacent to each other, and an etching stopper film (7) covering an upper surface of the conductor patterns. A contact hole (15) is located in a part of a region between the adjacent conductor patterns and having an inner wall defined by a first pair of sides and a second pair of sides, the first pair of sides being defined by the conductor patterns. A

first insulation film (13) fills spaces between the conductor patterns where the contact hole is not formed and extends over the etching stopper film. A sidewall insulation film (17, 17') is formed on an inner wall of the contact holes so that side walls of the conductor pattern and the etching stopper film are covered. Fukase shows all of the elements of the claims except the first insulation film being in contact with the side walls of the conductor patterns. Kimura shows (fig. 1) a semiconductor device in which conductor patterns (7) are formed on a substrate (1). A first interlayer insulating film (11) is formed on the substrate and is in contact with the side walls of the conductor patterns. In the configuration of an interlayer insulating film formed on gates without sidewall spacers, the device can be manufactured with a lower number of steps and higher degree of integration (col. 5, lines 50-56). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the contact structure of Fukase by forming the first interlayer insulation film on the sidewalls of the conductor patterns as taught by Kimura to simplify the manufacturing process and increase the degree of integration.

In re claim 3, Fukase nor Kimura a plurality of contact holes are formed adjacent to each other with the conductor patterns therebetween. However, it would have been obvious to one of ordinary skill in the art to use three, four, etc., contact holes since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960). See also MPEP 2144.04 VI. (B). One of ordinary skill in the art at the time the invention

was made would have been motivated to form more contact holes between more conductor patterns to form an array of transistor pairs for a memory device.

In re claim 5, Fukase shows (figs. 2A and 2G) a second insulation film (6) of silicon oxide (col. 5, lines 49-54) , which is known to have a lower dielectric constant than the silicon nitride etch stop layer (7), formed between the first conducting film and the etching stopper film.

In re claim 6, Fukase discloses (col. 5, lines 49-54) that the etching stopper film is formed of conducting film such as silicon nitride. Silicon nitride is thermally conductive and thus a conducting film because it conducts heat.

In re claim 7, Fukase shows (fig. 2G) a second conducting film (19) is formed on the first insulation film and connected to the base substrate (via the plug 18) in the contact hole. The etching stopper film is formed only in a region where the first conducting film intersects the second conducting film.

Claims 8, as far as understood, is rejected under 35 U.S.C. 103(a) as being unpatentable over Fukase (US 5,728,596) in view of Kimura (US 6,127,734) as applied to claim 2 above, and further in view of Hosotani et al. (US 5,977,583)

In re claim 8, Fukase and Kimura show all of the elements of the claims except the sidewall insulation film formed of a material having the etching characteristics equal to those of the etching stopper film. Hosotani et al. discloses (col. 8, lines 20-46) that the sidewall insulation film is formed of a silicon nitride which has etching characteristics equal to those of the etching stopper film because the etching stopper film is also made

of silicon nitride. By forming the sidewall insulation film of the same material as the etching stopper, the sidewalls of the gate electrode and insulating film are given the same enhanced protection and isolation as the areas of the gate covered by the etching stopper film. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the sidewall insulation film of Fukase and Kimura by forming it of a material having the same etch characteristics as the etching stopper as taught by Hosotani to provide similar enhanced protection and isolation as provided by the etching stopper.

Allowable Subject Matter

Claims 1, 4, 12 and 14 are allowed.

The following is an examiner's statement of reasons for allowance: The prior art references do not show a sidewall insulation film formed on inner walls of the first insulation film, each sidewall of the two conductor patterns, and each side wall of the etching stopper film in the contact hole wherein each of the etching stopper films is completely covered by the first insulation film and the respective sidewall insulation films. The closest prior art reference, Fukase (US 5,728,595) shows that portions of the etching stopper film in the contact hole is not completely covered by the first insulation film and etching stopper film. The prior art also does not show a plurality of bit lines formed over the first insulation film and extended in a second direction, an etching stopper film covering upper surfaces of the bit lines and a second insulation film filling

spaces between the plurality of bit lines where the contact hole is not formed, wherein the second insulation film does not extend over the etching stopper film.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

Applicant's arguments filed with respect to the 35 USC 112 second paragraph rejection of claims 2, 3, and 5-8 have been fully considered but they are not persuasive. The applicant asserts that the amendment to the claims overcomes the rejection, however the examiner maintains that the rejection is still necessary. The limitation that the first insulation film does "not extend over the etching stopper film" renders the claim indefinite. If the first insulation film does not extend over the etching stopper film, then that first insulating film cannot have ends defining the second pair of sides of the contact hole and the sidewall insulation film cannot cover the sidewalls of the first insulation film. Based on the language of the claim, it is assumed that the embodiment being described pertains to figure 1 of the drawings. Therefore, the claims will be interpreted in light of figure 1 until the claims are amended properly.

Applicant's arguments with respect to the 35 USC 103 rejection of claims 2, 3, and 5-8 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Warren whose telephone number is (571) 272-1737. The examiner can normally be reached on Mon-Thur and alternating Fri 9:00-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew E. Warren



May 15, 2006